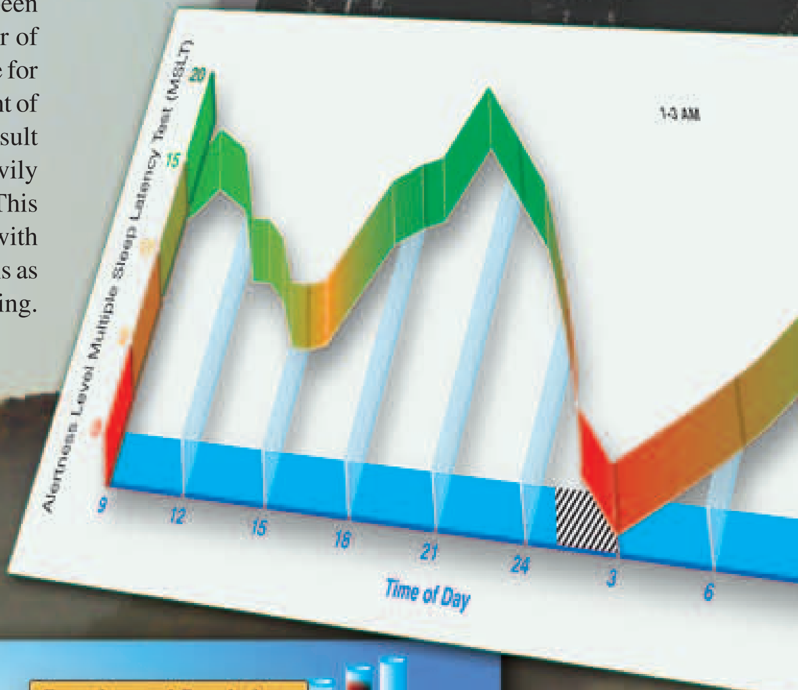
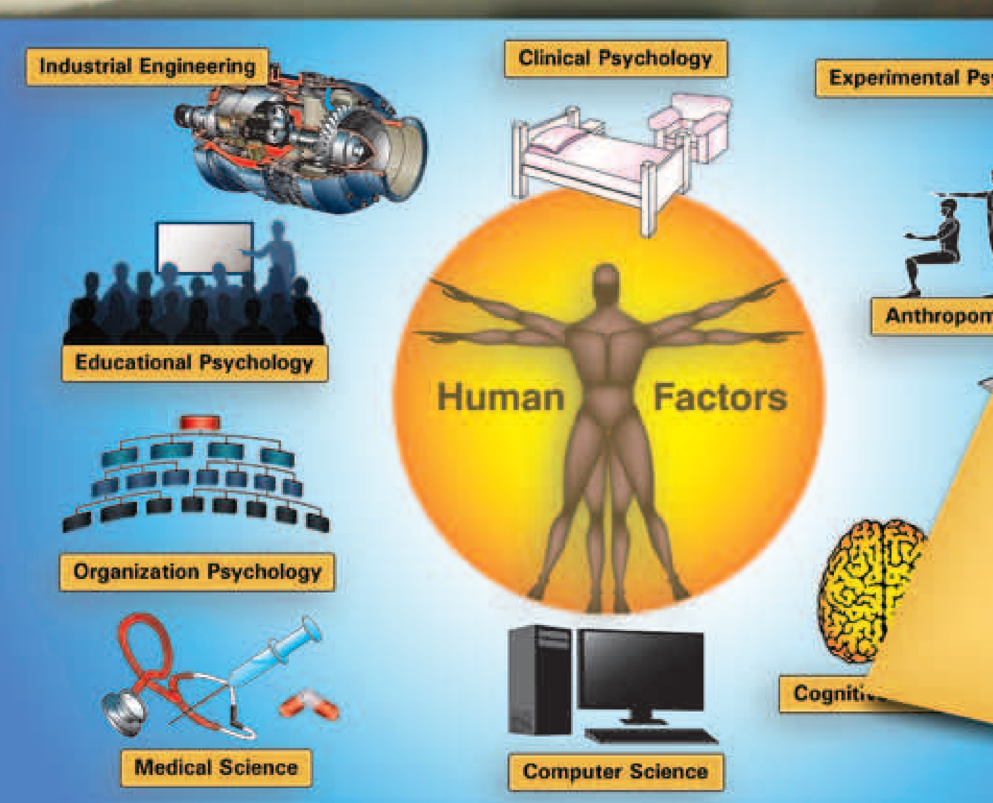
Chapter 13

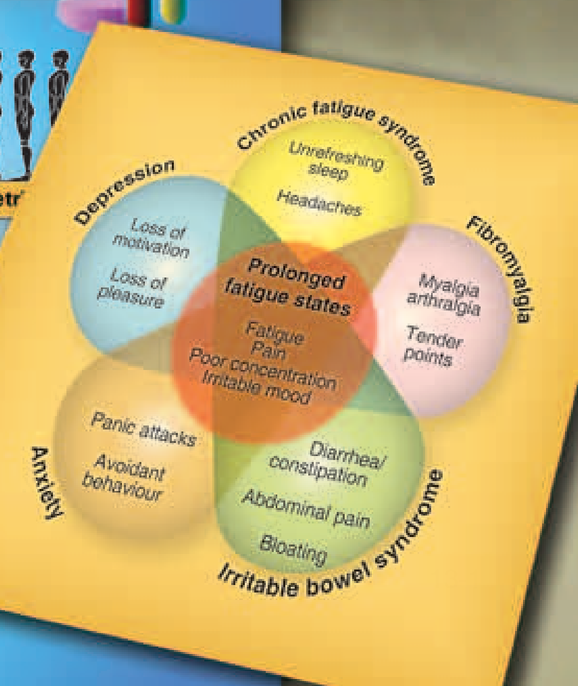
Human Factors

Introduction

The term human factors is often associated with ergonomics and is documented as the only discipline that focuses on the interaction of humans and technology. *[Figure 13-1]* When referring to human factors, we immediately think of the 3 Ds: development, design, and deployment of systems and devices that improve system-human interface. While there is much more to human factors than the 3 Ds, behavior intervention and modification is a necessary component to ensuring a safer aviation environment. As there have been great strides over recent decades to decrease the number of aviation accidents, human error remains the biggest hurdle for safety professionals. Research has shown nearly 80 percent of aviation accidents are attributed to human error. As a result of this finding, the aviation environment must rely heavily on minimizing human error to ensure a safer air space. This chapter focuses specifically on key elements associated with human error and systems related to glider flying operations as well as some of the physiological issues involved in soaring.







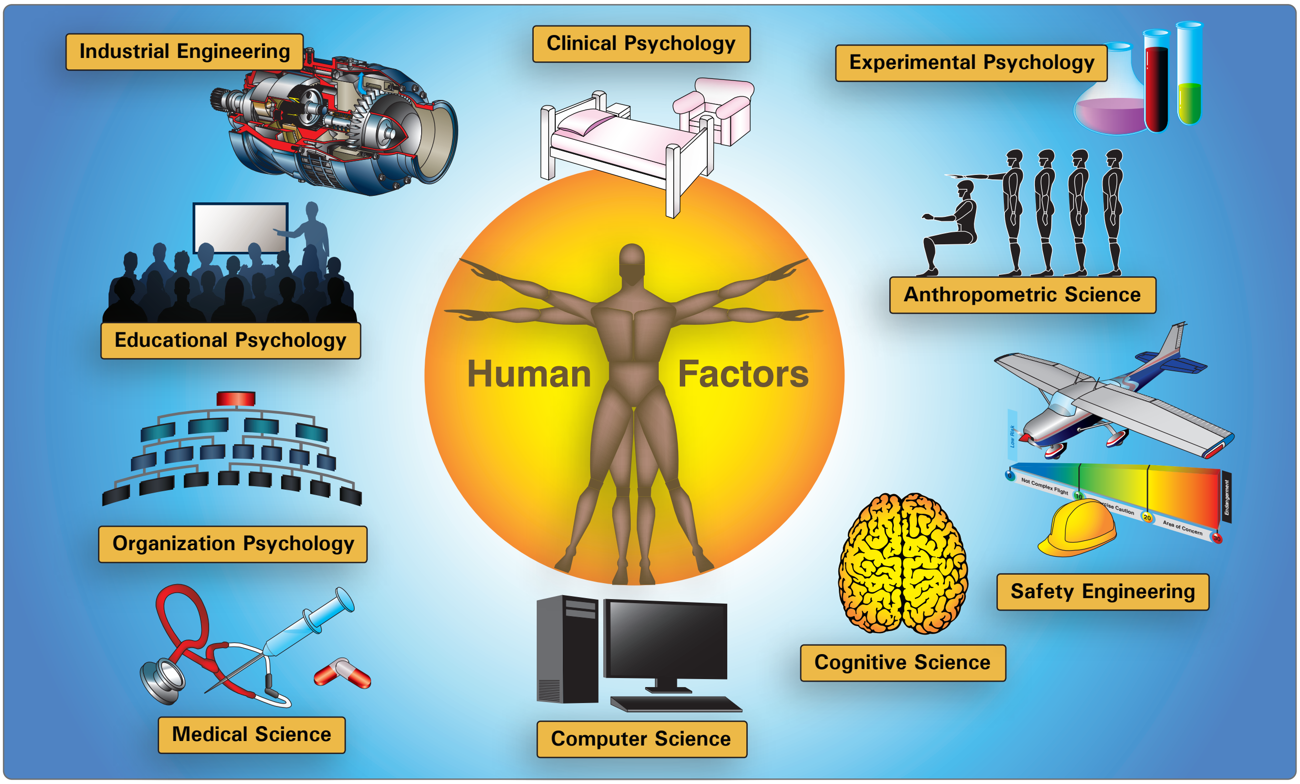


Figure 13-1. *1 Human factor disciplines.*

Learning from Past Mistakes

The National Transportation Safety Board (NTSB) generates accident reports any time a reportable glider accident occurs. This information is open to the public and can be found at www.ntsb.gov/ntsb. Once on the accident query page, enter the term "glider," which retrieves all reports pertaining to gliders to include tow plane accidents. It is important for pilots to review NTSB accident reports and learn what the common errors and hazards are that apply to glider operations. Learning from others mistakes helps reduce future accident rates.

An NTSB query from November 1, 2010, through October 31, 2011, shows 27 glider accidents. Shown in *Figure 13-2* are some of the accidents reported during that time to include the type of aircraft, injuries, and the probable cause of the accident (if given).

Recognizing Hazardous Attitudes

It is important that pilots ensure their flight is safe by following procedures and checklists rather than hope for a safe flight and doing things they know are not right. As technological advances have contributed to fewer mechanical failures, which in turn has created a much safer air space, human error remains a constant factor in aviation accidents. There is a wealth of information available that focuses on unsafe behaviors and attitudes. For the purpose of this chapter, three common behaviors are addressed: complacency, indiscipline, and overconfidence. While complacency, indiscipline, and overconfidence share a common theme (each stem from experience), it is necessary to further delineate on the contributions of attitude-behavior linkage. To do so, we must further explore each term respectively.

Complacency

Often glider operations can seem less stressful than other modes of flight for no other reason than the "meditative silence" that accompanies gliding through the air. This is why complacency can easily materialize. Complacency is when a person has a sense of security about one's surrounding yet fails to recognize or lacks awareness of possible danger. As pilots accrue flight time, their experience increases and, while one might view this as positive, their experience complacency may emerge. All too often, with experience comes boredom, a desire to cut corners, distractibility, feelings of content, minimal performance, and intentionally overlooking basic safety precautions (i.e., "I've done this a million times, it is not necessary to follow a checklist.").

A few countermeasures include:

- Never assume all facets related to the flight will go smoothly.
- Always prepare and expect the unexpected.

Aircraft Type	Injuries	Probable Cause
Burkhart GROB G-103A Twin II ACRO	2 uninjured	The certified flight instructor's inadequate compensation for the crosswind and delayed remedial action during landing, which resulted in a ground loop.
Schweizer SGS 1-23D	1 minor	The pilot's loss of control during an intentional aerobatic maneuver (spin) resulting in a collision with trees.
Mcholland C L Solitare	2 uninjured	The glider pilot’s misjudgment while approaching to land, which resulted in an off-airport landing.
AMS-Flight D.O.O. DG-500 Elan Orion	2 uninjured	The in flight loss of lift while landing, resulting in a collision with a fence.
Glasflugel Standard Libelle	1 fatal	Probable cause not yet released.
Rolladen-Schneider GMBH LS-3	1 serious	The glider pilot's delayed response to changing weather conditions, which resulted in an off-airport landing into trees.
Burkhart GROB Flugzeugbau G102 Club Astir IIIB	1 fatal	Probable cause not yet released.
LET L 33 Solo	1 fatal	Probable cause not yet released.
Doktor Fiberglass H101 Salto	1 uninjured	The glider's encounter with turbulence and loss of lift, which resulted in a ditching in a lake.
Schleicher ASW-27	1 minor	Glider struck two transmission lines.
Schweizer SGS 2-33A	2 uninjured	Each pilot thought that the other had control of the aircraft.
Eiriavion OY PIK 20B	1 uninjured	Probable cause has not been determined.
Schleicher ASW-20	1 fatal	Probable cause has not been determined.
Schweizer SGS 2-32	1 fatal, 1 serious	Probable cause has not been determined.
Schweizer SGS 2-32	1 serious, 2 uninjured	The pilot’s inadequate altitude to clear a ridgeline while maneuvering over a mountainous area.

Figure 13-2. *Some accidents reported by the National Transportation Safety Board (NTSB) from November 1, 2011 through October 31, 2012.*

- Play the “what if” game and offer solutions to the scenarios you create.

The key to preventing complacency is keeping your mind sharp at all times by “being proactive rather than reactive.”

Indiscipline

Much like complacency, as pilots gain experience the failure to comply with certain standards seem to be evident in many aviation accidents. Either they feel their experience has taught them an easier or faster way to do certain tasks, or their attitude is not in alignment with the guidelines set forth by more experienced aviators. Nevertheless, indiscipline can be a very dangerous attitude that can easily lead to unsafe behaviors.

Overconfidence

Similarly to complacency, familiar circumstances or repetition can lead to a state of overconfidence. Developing and maintaining a sense of confidence toward your abilities is acceptable unless it leads to cutting corners and ignoring proper procedure.

Human Error

Human error is defined as a human action with unintended consequences. There is nothing inherently wrong or troublesome with error itself, but when you couple error with aviation and the negative consequences that it produces it becomes extremely troublesome. Training, flight examinations (written or oral), and operational checks should not be restricted to attempt to avoid errors but rather to make them visible and identify them before they produce damaging and regrettable consequences. Simply put, human error is not avoidable but it is manageable. *[Figure 13-3]*

Types of Errors

Unintentional

An unintentional error is an unintentional wandering or deviation from accuracy. This can include an error in your action (a slip), opinion, or judgment caused by poor reasoning, carelessness or insufficient knowledge (a mistake). For example, a pilot reads the glider performance numbers from

Figure 13-3. *Safety awareness will help foresee and mitigate the risk of human error.*

the Pilot's Operating Handbook (POH) and unintentionally transposed the number 62 to 26. He or she did not mean to make that error but unknowingly and unintentionally did.

Intentional

In aviation, an intentional error should really be considered a flight violation. If someone knowingly or intentionally chooses to do something wrong, it is a violation, which means that one has deviated from safe practices, procedures, standards, or regulations.

Human and Physiological Factors that Affect Flight

Fatigue

Fatigue is a major human factor that has contributed to many maintenance errors resulting in accidents. Fatigue can be mental or physical in nature. Emotional fatigue also exists and effects mental and physical performance. A person is said to be fatigued when a reduction or impairment in any of the following occurs: cognitive ability, decision-making, reaction time, coordination, speed, strength, and balance. Fatigue reduces alertness and often reduces a person's ability to focus and hold attention on the task being performed. *[Figure 13-4]*

Symptoms of fatigue may also include short-term memory problems, channeled concentration on unimportant issues while neglecting other factors that may be more important, and failure to maintain a situational overview. A fatigued person may be easily distracted or may be nearly impossible to distract. He or she may experience abnormal mood swings. Fatigue results in an increase in mistakes, poor judgment, and poor decisions or perhaps no decisions at all. A fatigued person may also lower his or her standards.

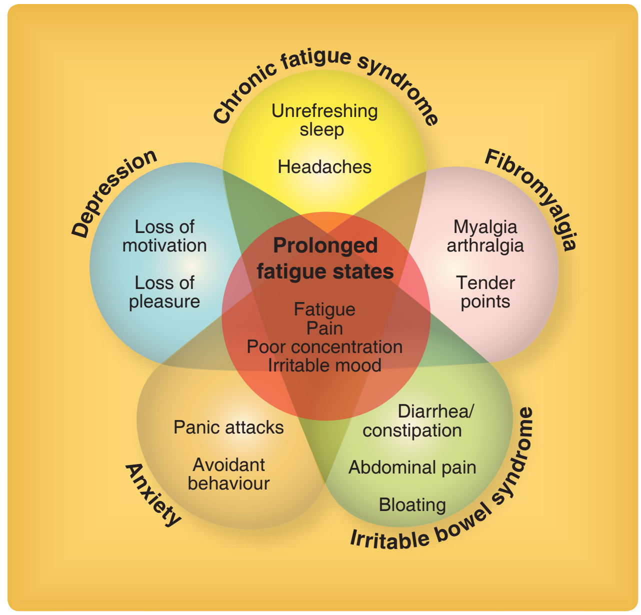


Figure 13-4. *Fatigue can be mental or physical and effects both mental and physical performance.*

Tiredness is a symptom of fatigue. However, sometimes a fatigued person may feel wide awake and engaged in a task. The primary cause of fatigue is a lack of sleep. Good restful sleep free from drugs or alcohol is a human necessity to prevent fatigue. Fatigue can also be caused by stress and by overworking. A person's mental and physical state also naturally cycles through various levels of performance each day. Variables such as body temperature, blood pressure, heart rate, blood chemistry, alertness, and attention rise and fall in a pattern daily. This is known as one's circadian rhythm. *[Figure 13-5]* A person's ability to work (and rest) rises and falls during this cycle. Performance counter to circadian rhythm can be difficult. Until it becomes extreme, a person may be unaware that he or she is fatigued. It is easier recognized by another person or in the results of tasks being performed. Flying alone when fatigued is particularly dangerous.

The best remedy for fatigue is to get enough sleep on a regular basis. Pilots must be aware of the amount and quality of sleep obtained. Countermeasures to fatigue are often used. Effectiveness can be short lived and many countermeasures may make fatigue worse. Caffeine is a common fatigue countermeasure. Pseudoephedrine found in sinus medicine and amphetamines are also used. While effective for short periods, a fatigued person remains fatigued and may have trouble getting the rest needed once they try to sleep.

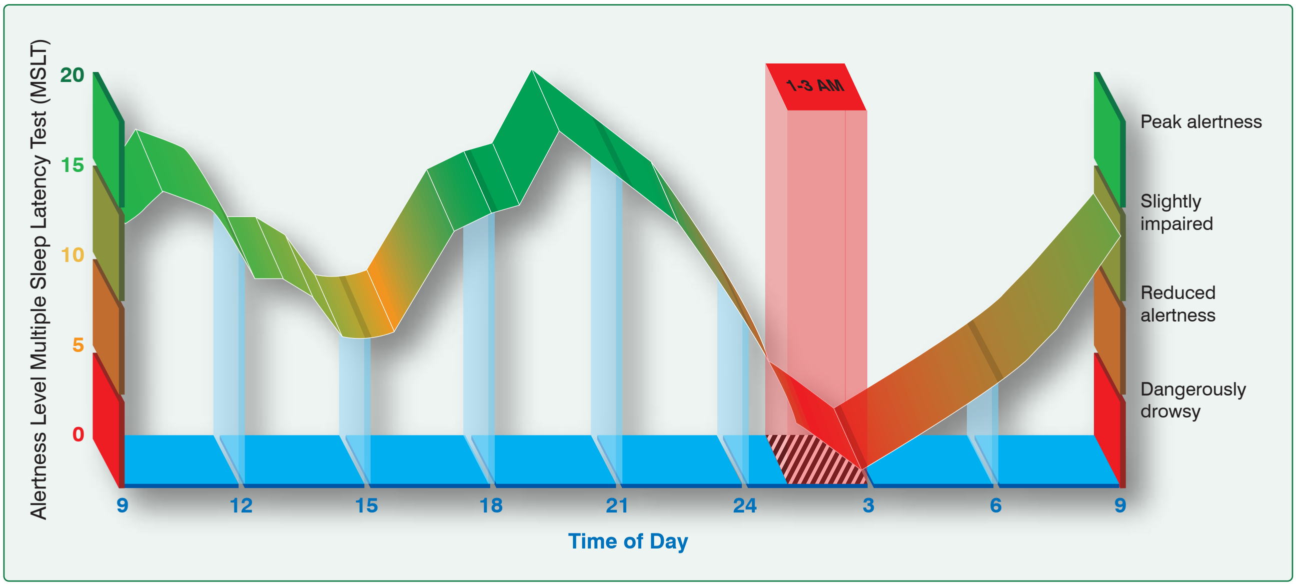


Figure 13-5. *Many human variables rise and fall daily due to one's natural circadian rhythm.*

If you find yourself suffering from acute fatigue, stay on the ground. Glider pilots often become fatigued while flying due to soaring in close proximity to other gliders in areas of lift or because of the constant requirement to see and avoid other traffic. Getting adequate rest is the only way to prevent fatigue from occurring. You should avoid flying when you have not had a full night's rest, when you have been working excessive hours, or have had an especially exhausting or stressful day. If you suspect you are suffering from chronic fatigue, consult your doctor.

Hyperventilation

Hyperventilation occurs when you are experiencing emotional stress, fright, or pain, and your breathing rate and depth increase, although the carbon dioxide is already at a reduced level in the blood. This can happen to both the experienced and novice pilot. Hyperventilation causes an excessive loss of carbon dioxide from your body, which can lead to unconsciousness due to the respiratory system's overriding mechanism to regain control of breathing.

Glider pilots who encounter extreme or unexpected turbulence or strong areas of sink over rough terrain or water may unconsciously increase their breathing rate. When flying at higher altitudes, either with or without oxygen, a tendency to breathe more rapidly than normal may occur, which can lead to hyperventilation.

It is important to know the symptoms of hyperventilation and correctly treat for it. *[Figure 13-6]* Treatment for hyperventilation involves restoring the proper carbon dioxide level back in the body. Breathing normally is both the best prevention and the best cure for hyperventilation. In addition to slowing the breathing rate, you also can breathe into a paper bag or talk aloud to over-come hyperventilation. Recovery is usually rapid once the breathing rate is returned to normal.

Common Symptoms of Hyperventilation
Headache
Decreased reaction time
Impaired judgment
Euphoria
Visual impairment
Drowsiness
Lighthеaded or dizzy sensation
Tingling in fingers and toes
Numbness
Pale, clammy appearance
Muscle spasms

Figure 13-6. *Common symptoms of hyperventilation.*

Inner Ear Discomfort

Gliders are not pressurized, therefore, pressure changes can affect glider pilots that are flying at high altitudes. Inner ear pain and a temporary reduction in ability to hear are caused by the ascents and descents of the glider. The physiological explanation for this discomfort is a difference between the pressure of the air outside the body and the air inside the middle ear. The middle ear cavity is small and located in the bone of the skull. While the external ear canal is always at the same pressure as the outside air, the pressure in the middle ear often changes more slowly. Even a slight difference between external pressure and middle ear pressure can cause discomfort.

When a glider ascends, middle ear air pressure may exceed the pressure of the air in the external ear canal, causing the eardrum to bulge outward. This pressure change becomes apparent when you experience alternate sensations of "fullness" and "clearing." During a descent, the reverse happens. While the pressure of the air in the external ear canal increases, the middle ear cavity, which equalized with the lower pressure at altitude, is at lower pressure than the external ear canal. The result is higher outside pressure, causing the eardrum to bulge inward.

This condition can be more difficult to relieve due to the fact that air must be introduced into the middle ear through the eustachian tube to equalize the pressure. The inner ear is a partial vacuum and tends to constrict the walls of the eustachian tube. To correct this often painful condition, which causes temporary reduction in hearing sensitivity, pinch your nostrils, close your mouth and lips, and blow slowly and gently in the mouth and nose. This procedure, called the valsalva maneuver, forces air up the eustachian tube into the middle ear.

Spatial Disorientation

For glider pilots, prevention is the best remedy for spatial disorientation. If the glider you are flying is not equipped for instrument flight, and you do not have many hours of training in controlling the glider by reference to instruments, it is best to avoid flight in reduced visibility or at night when the horizon is not visible. Susceptibility to disorienting illusions can be reduced through training, awareness, and learning to rely totally on your flight instruments. *[Figure 13-7]*

Figure 13-7. *Learning to rely totally on flight instruments to fly will reduce the likelihood of experiencing a disorienting illusion while in flight.*

Dehydration

Dehydration is the term given to a critical loss of water from the body. The first noticeable effect of dehydration is fatigue, which in turn makes top physical and mental performance difficult, if not impossible. Glider pilots often fly for a long period of time in hot summer temperatures or at high altitudes. This makes dehydration very likely for two reasons: the gliders clear canopy offers no protection from the sun and, at high altitudes, there are fewer air pollutants to diffuse the sun's rays. The result is continual exposure to heat that the body attempts to regulate by perspiration. If this fluid is not replaced, fatigue progresses to dizziness, weakness, nausea, tingling of hands and feet, abdominal cramps, and extreme thirst. *[Figure 13-8]*

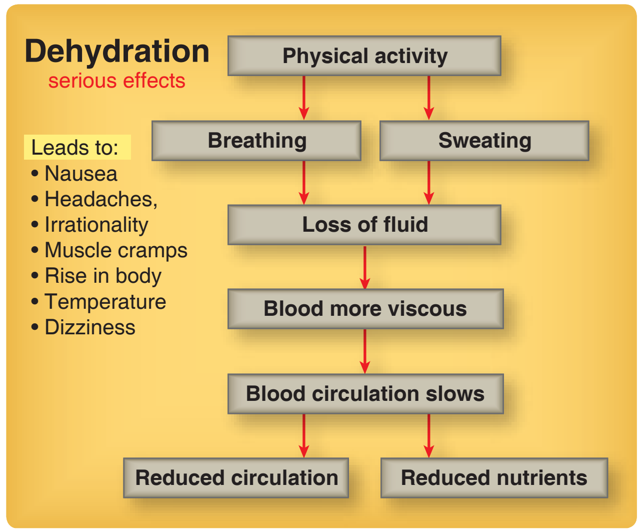


Figure 13-8. *Symptoms of dehydration.*

Water should be taken on every flight to prevent dehydration. The effects of dehydration on a pilot's performance are subtle, but can be dangerous and are especially a factor in warmer climates. Some glider pilots wear a hat to block the sun from distracting their ability to fly and see the instruments. Pilots should ensure that the brim of the hat is not too large, which can interfere with the ability to scan for other gliders and air traffic.

Heatstroke

Heatstroke is a condition caused by any inability of the body to control its temperature. Onset of this condition may be recognized by the symptoms of dehydration, but also has been known to be recognized only by complete collapse. To prevent these symptoms, it is recommended that you carry an ample supply of water and use it at frequent intervals on any long flight, whether you are thirsty or not. Wearing light colored, porous clothing and a hat provides protection from the sun. It is also helpful to keep the cockpit well ventilated, which aids in dispelling excess heat.

Cold Weather

When flying at higher altitudes, the inside of the glider can get cold. Proper clothing is a must since temperatures of –30° to –60 °C may be encountered at altitude. Proper preparation for the cold is especially difficult since temperatures on the ground are often pleasant on wave soaring days. Sunshine through the canopy keeps the upper body amazingly warm for a time, but shaded legs and feet quickly become cold. Frostbite is a very real threat. After an hour or two at such temperatures, even the upper body can become quite cold. Layered, loose-fitting clothing helps insulate body heat. Either wool gloves or light, fitted gloves with mittens over them work best for the hands. Mittens make tasks such as turning radio knobs difficult. For the feet, two or three pairs of socks (inner, silk; outer, wool) with an insulated boot are recommended.

In addition, the low temperatures can cause two other symptoms: it frosts your exhaled breath on the inside of the canopy and it causes the kidneys to excrete liquid at an accelerated rate.

A clean piece of cloth (that will not damage the canopy) can be used to wipe the condensation or frost from the canopy, if needed, but the best way to clear the canopy is a little fresh air through the side or front vent to help delay the buildup of frost. Unfortunately, this also quickly lowers the inside temperature, so it is best to wear clothing in layers so that you can easily take off or put on what is needed. There is little that can be done for the kidneys excreting liquid at an accelerated rate. The best course of action is to plan for it in advance by making a bathroom stop before you take off. Remember that the body is dehydrating more rapidly because of the cold and always be looking for signs of dehydration.

Cockpit Management

Prior to launch, passengers should be briefed on the use of safety belts, shoulder harnesses, and emergency procedures. If ballast is used, it must be properly secured. Organize the cockpit so items needed in flight are accessible. All other items must be securely stowed. The necessary charts and cross-country aids should be stowed within easy reach of the pilot.

Personal Equipment

If a parachute of the approved type is to be available for emergencies, Title 14 of the Code of Federal Regulations (14 CFR) part 91 requires that a certificated and appropriately-rated parachute rigger repack it within the preceding 180 days if it is made of nylon. The packing date information is usually found on a card contained in a small pocket on the body of the parachute.

Oxygen System

14 CFR part 91 also requires that the pilot in command (PIC) use supplemental oxygen for flights more than 30 minutes in duration above 12,500 feet and at all times during a flight above 14,000 feet. If supplemental oxygen is used, the system should be checked for flow, availability, and the PRICE checklist should be used:

- P = Pressure
- R = Regulator
- I = Indicator
- C = Connections
- E = Emergency bail-out bottle

The importance of understanding the need for oxygen equipment in gliders has been heightened in recent years by a considerable increase in the number of high-altitude soaring flights. The exploration of mountain waves has led to numerous flights at altitudes in excess of 30,000 feet with several record flights in excess of 40,000 feet. In some parts of the country, it is frequently possible to soar to a 16,000- to 18,000-foot cloud base in thermals. In almost all parts of the United States such altitudes are attainable in cumulonimbus clouds.

At 18,000 feet, air density is only one-half that at sea level. The purpose of breathing is to supply oxygen to the blood and remove carbon dioxide. In each breath at 18,000 feet, the pilot breathes in only half as much oxygen as at sea level. This is not enough to deliver an adequate supply of oxygen to the blood, and the situation worsens as altitude increases. The automatic reaction is to breathe twice as fast. This hyperventilation, or overbreathing, is almost worse than going up without oxygen in the first place because it results in eliminating too much carbon dioxide from the blood. The immediate effects of hyperventilation are:

- Spots before the eyes
- Dizzy feeling
- Numbing of fingers and toes, followed by possible unconsciousness

The dangers of oxygen deprivation should not be taken lightly. At around 20,000 feet MSL, pilots might have only 10 minutes of "useful consciousness." By 30,000 feet MSL, the time frame for "useful consciousness" decreases to 1 minute or less. For planned flights above 25,000 feet MSL, an emergency oxygen backup or bailout bottle should be carried.

The U.S. Air Force in cooperation with the Federal Aviation Administration (FAA) provides a 1-day, high-altitude orientation and chamber ride for civilian pilots. The experience is invaluable for any pilot contemplating high-altitude soaring and is even required by many clubs and operations as a prerequisite.

Aviation Oxygen Systems

Aviation oxygen systems are designed for airborne aviation applications. Unlike a medical-type oxygen system, an aviation system is generally much lighter, compact, and calibrated to deliver oxygen based on extensive research in human flight physiology. Prior to purchasing any type of oxygen system, pilots should research the different options and choose an oxygen system that is appropriate for the type of flying that they do because there are many manufacturers and types of system available. Two common types of systems used today are the Continuous-Flow System and the Electronic Pulse Demand Oxygen System (EDS).

Continuous-Flow System

The continuous-flow system uses a high-pressure storage tank and a pressure-reducing regulating valve that reduces the pressure in the cylinder to approximately atmospheric pressure at the mask. *[Figure 13-9]* The oxygen flow is continuous as long as the system is turned on. In some installations, it is possible to adjust the amount of oxygen flow manually for low, intermediate, and high altitudes; automatic regulators adjust the oxygen flow by means of a bellows, which varies the flow according to altitude. When using the continuous-flow oxygen system, the pilot can use either an oxygen mask or a nasal cannula. *[Figures 13-10* and *13-11]*

Figure 13-9. *Continuous-flow oxygen system.*

Electronic Pulse Demand Oxygen System (EDS)

The EDS is the lightest, smallest, and most capable on-demand oxygen system available that delivers altitude-compensated pulses of oxygen only as you inhale, using as little as ⅛, typically ⅙ the amount of oxygen at ¼ the weight and volume over conventional constant-flow systems that deliver one liter per minute per 10,000 feet. *[Figure 13-12]* The EDS has a precision micro-electronic pressure altitude barometer that automatically determines the volume for each oxygen pulse up to pressure altitudes of 32,000 feet and higher altitudes are compensated with pulses of greater volume. The EDS automatically goes to a 100 percent pulse-demand mode at pressure altitudes above 32,000 feet.

Figure 13-10. *Oxygen mask.*

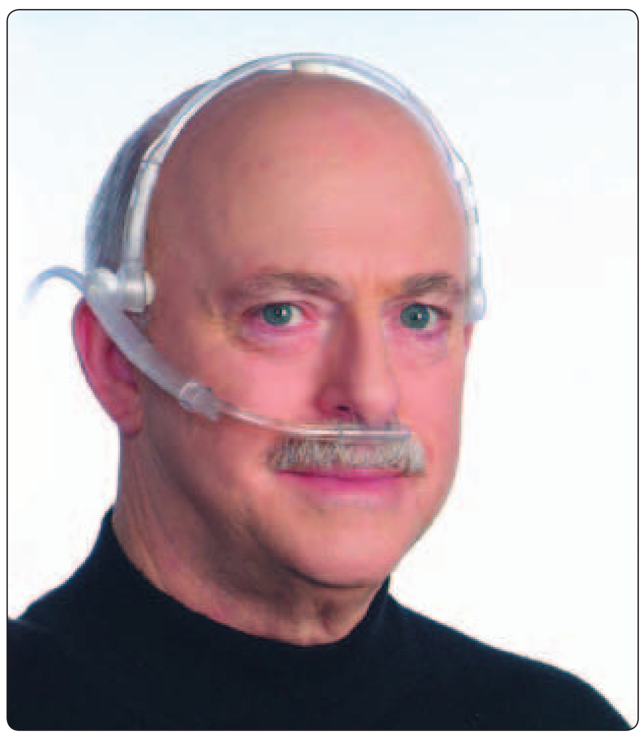


Figure 13-11. *Nasal cannula.*

Figure 13-12. *Electronic Pulse Demand Oxygen System (EDS).*

The EDS can be set to one of three D (day or delayed) modes and delays, responding with oxygen until it senses pressure altitudes of approximately 5,000 or 10,000 feet, conserving oxygen when it is not needed. It can also be set to N (night or now) mode for night flying where it responds from sea-level and up. Both modes provide the same amount of oxygen, automatically tracking pressure altitude changes. The EDS limits its response to a maximum respiration rate of about 20 breaths per minute, virtually eliminating hyperventilation usually encountered in stressful situations. There are no scales to observe or knobs to turn as you climb or descend. Adjusting (zeroing) for new barometric pressures is not needed because the EDS responds directly to pressure altitude, as do the physiological properties of your body.

Transponder Code

The Federal Aviation Administration (FAA) has assigned transponder code 1202 for use by gliders not in contact with an air traffic control (ATC) facility with an effective date of March 7, 2012. The notice was published in JO 7110.577, a copy of which is available on the FAA website at www.faa.gov. Gliders operating in areas where there is an agreement with local ATC to use a different code should contact the agreement sponsor for guidance on which code to use.

Definitions

- SQUAWK: The 4-digit code set in the transponder, such as 1202.
- IDENT or SQUAWK IDENT: A controller may ask you to "ident" or "squawk ident" to verify your location on the radar screen. Do NOT push the ident button unless they ask you to. When asked, push the button on the transponder marked IDENT. This causes the target on the controllers radar screen to change, identifying your transponder location.
- Tow planes are to Squawk 1200, as normal.

Risk Management

Risk management, a formalized way of dealing with hazards, is the logical process of weighing the potential costs of risks against the possible benefits of allowing those risks to stand uncontrolled. In order to better understand risk management, the terms "hazard" and "risk" needs to be understood.

Hazard identification is a process used to identify all possible situations where people may be exposed to injury, illness, or disease. Typical hazards are weather, mountains, obstacles, and operational and equipment failure.

Risk is the chance of a hazard actually causing damage and/or injury. Risk is measured in terms of consequences and likelihood. Risk management is the overall process of risk identification, risk analysis, control of risks, and risk evaluation. Risk control is part of risk management that involves the implementation of policies, standards, procedures, and physical changes to eliminate or minimize adverse risks. For example, the pilot understands the risk of a tow line break during launch. An acceptable risk that he or she can mitigate by understanding the risk and having a plan of actions to follow after a tow line breaks.

Safety Management System (SMS)

The Safety Management System (SMS) is a formal, top-down business approach to managing safety risk, which includes a systemic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures. SMS is becoming a worldwide standard throughout the aviation industry integrating risk management, occupational safety, health, security, environment, and other concepts for the management of a complete safety program. SMS is a comprehensive program designed for a formal organization. The individual pilot can learn from the process and apply the concept for his or her own personal safety considerations, such as:

- Risk management decision-making.
- Management capabilities before a system failure
- Risk controls through safety assurance
- Knowledge sharing between regulations and the pilot
- Promoting a safety framework by having a sound safety culture or attitude

Aeronautical Decision-Making (ADM)

Aeronautical decision-making (ADM) is a mental process used by pilots (systematically) to determine a course of action in response to a given set of circumstances.

- Circumstance: My oxygen system has a slow leak. Soaring conditions are prefect and I do not need oxygen for today.
- Circumstance: High winds are forecast later today, but I should return before the wind changes.
- Circumstance: My batteries are low, but I am only planning a short flight.

Learning effective ADM skills cannot be overemphasized. As advancement in training methods, airplane equipment and systems, and services continue for pilots, incidents and accidents still occur. Despite all the changes in technology to improve flight safety, the human factor is the same. The human factor is still involved in a high percent of all aviation accidents.

Circumstances as mundane as a "slow oxygen leak," a "high wind forecast," or "low batteries" are parts of a decision chain leading to an incident or accident. The term "pilot error" has been used to describe the causes of these accidents meaning that an action or decision made by the pilot was the cause or a contributing factor that led to the accident. In the previous circumstances, the chain is broken if the pilot—has the "slow oxygen leak" repaired—respects the "high wind forecast" and delays the flight—charges the "low batteries" before the next flight. The pilot error definition also includes the pilot's failure to make a decision or take action. Human factor-related accidents are accidents that did not involve a single decision but a chain of decision and factors leading to the accident. A "poor judgment chain," referred to as the error chain, describe the concept of contributing factors in a human factors-related accident. Breaking one link in the chain normally is all that is necessary to change the outcome of the sequence of events.

Advisory Circular (AC) 60-22, "Aeronautical Decision Making," provides introductory material, background information, and reference material on ADM. The material in this AC provides a systematic approach to risk assessment and stress management in aviation, illustrates how personal attitudes can influence decision-making, and how those attitudes can be modified to enhance safety in the cockpit. This AC also provides instructors with methods for teaching ADM techniques and skills in conjunction with conventional flight instruction.